

Cumulative Impacts

The 404(b)(1) Guidelines (Guidelines) require that the applicant demonstrate there are no practicable alternatives available that would have a less adverse impact on the aquatic environment for non-water dependent activities. The Guidelines presume that less damaging upland alternatives are available for these activities unless demonstrated otherwise by the applicant. The applicant must follow a sequence of steps to be in compliance with the Guidelines; which include avoidance, minimization, and compensation for unavoidable impacts.

Response: The applicant has in its Alternatives Analysis evaluated and given much thought to avoidance, minimization, and compensation for unavoidable impacts. The method of mining, location of boxcut pits, orientation of pits, location of sedimentation basins and drainage control structures and ditches, location of haul roads, location of support areas have all been evaluated and assessed so that the smallest and most efficient foot print is permitted and impacted.

The permit boundary has been restricted to the maximum extent possible to allow efficient and effective mining of the reserve. The eastern edge of the permit boundary abuts the previously approved Section 404 permit areas for the Bear Run Mine (East Pit) and the Bear Run Mine (Amendment 4) where surface coal mining and coal preparation facilities are located. Mining in the Bear Run Mine (East Pit) and the Bear Run (Amendment 4) area will advance into the proposed Amendment 5 area. The southern, northern, and western boundaries of the permit area are determined by the proposed mining plan, mineable coal boundary, land control and environmental factors. Boxcut spoil will be placed in the Bear Run (Amendment 4) area on areas previously mined and reclaimed prior to the Bear Run operations.

Large acreages of unmined land have been avoided through utilization of previously mined areas for the preparation plant, shop and offices, haul roads, plant make-up water, coal refuse disposal, boxcut spoil placement and sediment control measures. Advance disturbance will be minimized and concurrent high quality reclamation will be ongoing to keep the disturbed area to a minimum at any given time. Best Management Practices will be utilized to guard against negative impacts to the aquatic ecosystem outside of the area planned for mining. Best Management Practices include retention and monitoring of site run-off, use of quick growing cover crops, and silt fences or straw bales. In addition, temporary and permanent terracing and erosion control systems and filter strips will be employed in reclaimed agricultural fields. Stream and wetland mitigation will take place as quickly as practicable, employing the best techniques available to ensure successful mitigation. Mitigation areas will be monitored closely by well-trained staff and outside consultants will be utilized as needed (staff and consultant credentials provided in Section 5.D. of the permit application)

In terms of the process of developing a mine plan and permit boundary that minimizes and avoids aquatic impacts where possible, the following high level steps are taken.

- 1. Locate and evaluate the coal reserve thru geologic modeling, exploratory drilling and core sampling.*
- 2. Determine mineability and method of extraction*
 - a. Depth of seam(s), geologic conditions, reserve size and seam contours are evaluated.*

3. Determine marketability of the reserve
4. Determine transportation options
5. Evaluate land, mineral and permit needs for the project.
6. Determine support facility, equipments needs, and projected start up timing

If above analysis indicates the project will be profitable, then additional steps are followed.

1. Locate facilities with consideration given to environmental impacts, transportation options, available utilities, proximity to reserve to be mined, water supply and proximity to local communities. The environmental staff and mine engineers work together in both the initial and detailed planning.
2. If the project is a surface mine, then pit opening (box cut) locations are chosen.
 - a. Lower mining ratio areas are desirable to reduce initial start up costs and need for spoil disposal.
3. The necessary support features (sediment basins, diversions, etc.) are planned and designed for the initial mining area.
 - a. Existing features are utilized where possible to minimize environmental impacts to the extent possible and reduce costs.
 - b. Features requiring construction are located as close as possible to the planned coal extraction area to reduce environmental impacts and reduce the need for additional lands. A projected coal mine increases land prices in the mining area.
4. Land and mineral acquisition plans are developed based on the mine plan and timing needs.
 - a. Lands needed earlier in the mining process receive higher priority.
5. Initial permit boundaries are set and environmental assessments of streams, wetlands and aquatic resources begin as land control allows. Environmental assessments are necessary to fully evaluate potential avoidance and mitigation considerations.
6. Plans and permit boundaries are adjusted as necessary to provide for unwilling landowners, special environmental conditions, un-mineable areas discovered by additional drilling or other factors.
 - a. Areas of special environmental significance such as high quality wetlands and naturally functioning streams are considered for avoidance. Avoidance reduces temporal impacts, mitigation requirements, and may improve permitting approval times. This must be balanced with mining logistics and the best use of the resource per federal law.
 - b. Reclamation logistics are an important consideration as direct haulback reclamation both reduces temporal loss and saves money through reduced handling.
 - c. Areas previously disturbed by mining are usually good options due to decreasing environmental impacts, availability of water, fewer neighbors, etc.
7. Permits are submitted for review while land acquisition, mine and construction planning continue.
8. When necessary permits are issued, construction and development begins while land acquisition and plan adjustments continue. Many variables exist including market forces, end user needs, geologic anomalies, landowner issues, acquisition issues, coal quality issues, etc.

9. During development and mining, additional opportunities for avoidance and minimization are considered as mine plan adjustments are made.

The Bear Run (Amendment 5) project area has been selected for a number of factors that make the site unique:

Coal Quantity - this is one of the most important components of the site selection. The four coal seams to be mined by this operation on average generate 20,000 tons per acre. Most surface coal mine sites in the Midwest mine from one seam to three seams of coal. The Bear Run reserve represents one of the largest recoverable tons per acres of mineable coal in the Illinois Basin. For comparison, the Farmersburg Mine had been the largest-producing surface mine in the Illinois Basin for the past decade and averaged coal recovery of 7,800 tons per acre. To mine the same amount of coal, one acre of disturbance at Bear Run Mine would have required 2.6 acres at the Farmersburg Mine to meet the same tonnage. Surface mining is the only available method to safely and efficiently extract the extensive available coal reserve and prevent future impacts. The unique features of the Bear Run coal reserve are discussed further in Part D of the Alternatives Analysis.

Property and Mineral Control - surface property and coal reserves were acquired at a substantial cost. It is not economically feasible to relocate this site to an uncontrolled area even if an acceptable reserve was available. The lost time and additional investment with an unknown conclusion eliminate this as an option from a practical business perspective. Property control/access must be acquired before aquatic resources can be evaluated.

Existing Land Use and Site Location - land uses are primarily cropland, forest and previously mined areas. Topography is flat to rolling. The site occurs in a rural, sparsely populated setting and is isolated from most nearby residences. Existing land uses on previously-mined areas at the site have a long history of successful reclamation and reestablishment of post-mining land uses. Previously affected areas are being utilized to the largest extent possible for mining support facilities in order to avoid and minimize additional impacts to unmined lands.

Coal Quality - the coal seams to be mined by this operation are the Indiana 7-Coal, 6-Coal, 5A-Coal, and 5-Coal. These are needed, compatible fuel sources for existing coal-fired power plants which must continue to operate and produce electricity that is crucial to the economy and security of the United States. The average BTU content of the final saleable coal is ~11,000. While alternate sources of power generation are being developed on varying scale throughout the country, there is no viable, scalable, or economic replacement for coal in the foreseeable future.

Marketability - the site location allows for efficient access to existing infrastructure that currently supports transportation of coal to customers for energy production. The Indiana Rail Road Company completed a rail spur into the Bear Run site that provides access to rail lines which are located strategically to coal-fired electric utilities. Rail delivery will be the primary method of delivery of coal to the mine's customers, thereby reducing potential traffic onto local public roads.

Mining Ratio - In addition to the uncommonly high coal tons per acre at Bear Run, another unique aspect is the depth and distribution of the coal seams and the resulting mining ratio. Based on historical data and the current coal market, Peabody's Midwest Operations employ an average 20:1 mining ratio as its' basis for whether a reserve can be economically mined from a surface operation standpoint. The mining ratio is a calculation of overburden (both consolidated and unconsolidated above a coal seam) moved per clean ton of coal produced. The higher the mining ratio (or more overburden moved per clean coal ton), the higher the cost of producing coal. At locations like Bear Run, where multiple seams will be mined, the recoverable coal volume is factored together to lower the overall mining ratio for the entire coal reserve. The ratios of the Bear Run Mine (Amendment 5) reserve calculated from the surface to each seam is as follows:

<i>Bear Run Mine (Amendment 5) Mining Ratios</i>	
<i>Indiana 7-Coal seam</i>	<i>46:1</i>
<i>Indiana 6-Coal seam</i>	<i>26:1</i>
<i>Indiana 5A-Coal seam</i>	<i>24:1</i>
<i>Indiana 5-Coal seam</i>	<i>18:1</i>

All 4 seams must be mined in order to be economically feasible. This fact coupled with the high depth to the lowest seam causes avoidance of aquatic resources to be unfeasible. The only manner in which this mine can operate efficiently and safely is to open a pit once and advance consistently to the end of the mining.

Economic Impact - Based on 2016 financial data, the Bear Run Mine will have a total estimated sales impact of \$950,000,000 a total estimated wages and benefits impact of \$170,000,000 and a total estimated employment impact of 1,781 jobs on the Sullivan County area economy. Peabody also is estimated to pay local property taxes totaling approximately \$4,000,000 in 2016 (source Harding, Shymanski & Company, PSC, 2011). This analysis is included in the application.

- There is no discussion about starting the mining at the western boundary and then mining to the east. This approach would allow faster reclamation of stream form and function. USEPA requests Peabody provide a rational for not choosing this approach.

Response: The original and current plan at Bear Run is to mine north - south oriented pits from the east side of the reserve to the west side of the reserve as laid out in previous permits. The mine infrastructure, support facilities, and land acquisition plans have been established based upon this plan. The opening and advancement of these pits are well underway with significant investment already incurred by Peabody. If pits were opened on the west side of the permit it would result in many negative consequences. Additional box cut pits would have to be incurred. The north mining area alone would generate in excess of 40 million cubic yards of material that would have to be placed. This material would be placed on the western portion of the permit, disturbing a very large portion of land while preventing planned coal extraction. Development of these pits would

not allow Peabody to meet its coal production and delivery obligations. Furthermore, additional disturbance would be necessary to construct haulroads and drainage control structures to allow coal haulage back to the processing area. This approach would lead to increased temporal loss, increased land disturbance, and significant loss of coal reserve. Peabody does not agree this approach would allow faster reclamation of stream form and function. The opening of new pits would delay reclamation and essentially the same or more aquatic resources would be disturbed annually once pit advancement normalizes. Basically, the same open pit configuration would be utilized mining up stream; however, more clean water diversions would likely be needed to divert run off from entering the advancing pit to ensure a safe and driest possible pit that minimizes water contact with the open pit materials. The current mine plan of mining from east to west allows for minimal impacts from spoil disposal and gradual lengthening of the pit in the north mining area.

In a high level, conservative evaluation of mining from west to east, north to south or south to north, the following analysis is offered. To maximize recovery of the coal resource, mining should begin as close as possible to the coal edge regardless of the pit orientation. The south end of the south mining area and the north end of the north mining area do not provide enough contiguous length to allow pit openings that would allow use of the existing equipment nor meet production needs. Therefore, analysis is provided to address the following four alternatives:

1. North mining area - mining from west to east
2. North mining area - mining from south to north
3. South mining area - mining from west to east
4. South mining area - mining from north to south

Assumptions used in this analysis:

- Pit cuts will be 150' wide
- Average depth to lowest seam is 250'
- 2.5 cuts will be removed from the initial box cut and placed in spoil disposal areas.
- Spoil disposal areas will be constructed by removing 1 foot of topsoil and 3 feet of subsoil before placing spoil with an outer 4:1 slope and increase in elevation of 100 feet before leveling off.
- Required spoil disposal area along with necessary drainage control and soil stockpile areas will result in 1,500 feet wide area adjacent to each box cut spoil area. (300 feet for support areas, 1200 feet for spoil)
- Average cost of \$1.25/cubic yard(cy) to open box cut pits including soil handling.
- Assume average stream intensity of 60 linear feet per acre.
- Haulroad construction includes; removal of 1 foot of topsoil on 200' wide area, addition of 120' width and 10' depth of shale for base @\$1.50/cy. Each linear foot of haulroad costs \$80 to construct
- Average available coal is 20,000 tons per acre.

1. North mining area - mining from west to east. (Box cut length is ~15,000 LF)

	<u>Cost @ \$1.25/cy</u>
Box Cut spoil = 15,000' X 250' X 150' X 2.5 = 52,000,000cy	\$65,000,000
Soil removal support areas = 15,000'X300X1' = 167,000 cy	\$ 209,000
Soil replace support areas (same)	\$ 209,000
Soil removal spoil areas = 15,000'X1,200'X4' = 2,667,000 cy	\$ 3,333,000
Soil replace spoil areas (same)	\$ 3,333,000
Haulroad Construction = 9,000' @ \$80/LF	<u>\$ 720,000</u>
TOTAL COST*	\$72,804,000

(*Total Cost estimate is high level and does not include diversion and sed basin construction, additional reveg, required culverts and other miscellaneous costs.)

Loss of coal beneath spoil and support areas = 516 ac X 20,000 tons/ac = 10,330,000 tons
Stream impacts w/out coal extraction = 516 ac X 60'/ac = 30,960'

Summary of impacts utilizing alternative #1

- Extremely high cost of over \$72 Million
- Sterilization of over 10 Million tons of coal with new box cut spoil disposal area.
- Additional temporal loss from earlier impacts for haulroads, drainage control, etc.
- Bear Run will not be able to meet current sales commitments. Financial impact unknown.
- Prevents option for future mining west of Amendment 5.
- Loss of current invested \$ in ongoing box cut occurring on the east side of the reserve.

2. North mining area - mining from south to north. (Box cut length is ~10,000 LF)

	<u>Cost @ \$1.25/cy</u>
Box Cut spoil = 10,000' X 250' X 150' X 2.5 = 34,723,000cy	\$43,403,000
Soil removal support areas = 10,000'X300X1' = 111,000 cy	\$ 139,000
Soil replace support areas (same)	\$ 139,000
Soil removal spoil areas = 10,000'X1,200'X4' = 1,778,000 cy	\$ 2,223,000
Soil replace spoil areas (same)	\$ 2,223,000
Haulroad Construction = 5,000' @ \$80/LF	<u>\$ 400,000</u>
TOTAL COST*	\$48,527,000

(*Total Cost estimate is high level and does not include diversion and sed basin construction, additional reveg, required culverts and other miscellaneous costs.)

Loss of coal beneath spoil and support areas = 345 ac X 20,000 tons/ac = 6,900,000 tons
Stream impacts w/out coal extraction = 345 ac X 60'/ac = 20,700'

Summary of impacts utilizing alternative #2

- Extremely high cost of over \$48 Million
- Sterilization of approx. 7 Million tons of coal with new box cut spoil disposal area.
- Additional temporal loss from earlier impacts for haulroads, drainage control, etc.
- Bear Run will not be able to meet current sales commitments. Financial impact unknown.
- Loss of current invested \$ in ongoing box cut occurring on the east side of the reserve.

3. South mining area - mining from west to east. (Box cut length is ~12,000 LF)

	<u>Cost @ \$1.25/cy</u>
Box Cut spoil = 12,000' X 250' X 150' X 2.5 = 41,667,000cy	\$52,083,000
Soil removal support areas = 12,000'X300X1' = 133,000 cy	\$ 166,000
Soil replace support areas (same)	\$ 166,000
Soil removal spoil areas = 12,000'X1,200' X4' = 2,133,000 cy	\$ 2,666,000
Soil replace spoil areas (same)	\$ 2,666,000
Haulroad Construction = 10,000' @ \$80/LF	<u>\$ 800,000</u>

TOTAL COST* \$58,547,000

(*Total Cost estimate is high level and does not include diversion and sed basin construction, additional reveg, required culverts and other miscellaneous costs.)

Loss of coal beneath spoil and support areas = 413 ac X 20,000 tons/ac = 8,260,000 tons
Stream impacts w/out coal extraction = 413 ac X 60'/ac = 24,800'

Summary of impacts utilizing alternative #3

- Extremely high cost of over \$58 Million
- Sterilization of approx. 8 Million tons of coal with new box cut spoil disposal area.
- Additional temporal loss from earlier impacts for haulroads, drainage control, etc.
- Bear Run will not be able to meet current sales commitments. Financial impact unknown.
- Prevents option for future mining west of Amendment 5.
- Loss of current invested \$ in ongoing box cut occurring on the east side of the reserve.

4. South mining area - mining from north to south. (Box cut length is ~10,000 LF)

	<u>Cost @ \$1.25/cy</u>
Box Cut spoil = 10,000' X 250' X 150' X 2.5 = 34,723,000cy	\$43,403,000
Soil removal support areas = 10,000'X300X1' = 111,000 cy	\$ 139,000
Soil replace support areas (same)	\$ 139,000
Soil removal spoil areas = 10,000'X1,200'X4' = 1,778,000 cy	\$ 2,223,000
Soil replace spoil areas (same)	\$ 2,223,000
Haulroad Construction = 5,000' @ \$80/LF	\$ 400,000
TOTAL COST*	\$48,527,000

(*Total Cost estimate is high level and does not include diversion and sed basin construction, additional reveg, required culverts and other miscellaneous costs.)

Loss of coal beneath spoil and support areas = 345 ac X 20,000 tons/ac = 6,900,000 tons
Stream impacts w/out coal extraction = 345 ac X 60'/ac = 20,700'

Summary of impacts utilizing alternative #2

- Extremely high cost of over \$48 Million
- Sterilization of approx. 7 Million tons of coal with new box cut spoil disposal area.
- Additional temporal loss from earlier impacts for haulroads, drainage control, etc.
- Bear Run will not be able to meet current sales commitments. Financial impact unknown.
- Loss of current invested \$ in ongoing box cut occurring on the east side of the reserve.

Selecting any of alternatives 1-4 would cause a devastating financial loss to Bear Run as illustrated above. From an environmental standpoint, these alternatives would create additional aquatic impacts outside of coal extraction areas, as well as, increase temporal losses. The least damaging practicable alternative in fulfilling the project purpose and need at Bear Run is to continue the current mining plan that has been thoroughly analyzed and approved in previous permits.